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About a Computer

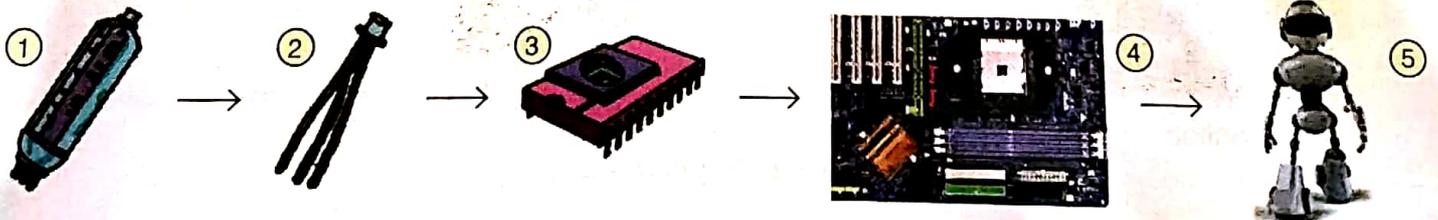
We will learn about

- Milestones in the development of computers
- Hardware and software
- Types of computer languages

Development of computers

Early humans used objects like stones, shells, and bones to count things. Thereafter, the first counting machine, the abacus, was invented. But it would take several more years of research and development to invent an electronic device that can do several jobs, called the computer. The evolution of computers occurred in phases, each phase yielding a new generation of computers. The table below will give you a summary.

Generation	Period of development	Major milestones achieved	Machines developed
First	1940 to 1956	Vacuum tubes ① introduced	ENIAC, EDVAC, UNIVAC, and EDSAC
Second	1956 to 1963	Semiconductors and transistors ② introduced	IBM 1401, 1620, and 7094 CDC 1604 and 3600
Third	1964 to 1971	Integrated circuits (ICs) ③ stored on silicon chips	IBM 360 series
Fourth	1971 till now	Large integrated circuits Very large integrated circuits ④	Minicomputers Personal computers High-speed precision computers of today
Fifth	Ongoing	Parallel processing and artificial intelligence (AI) ⑤	Supercomputers AI still in the development stage



How a computer works

All computers work on the IPO cycle, involving input, processing, and output. There are many input devices like the mouse, keyboard, optical pen, and scanner. The CPU of the computer processes the input according to the outlined instructions and gives the output through devices like the monitor, printer, and speakers.

There are two key components of a computer: the hardware and the software.

Hardware

Those parts of the computer that can be touched or felt, irrespective of being output or input devices, form the hardware.

Input devices The devices that help to feed data into the computer are called input devices. The keyboard, mouse, joystick, touchscreen, scanner, digital camera, and microphone are all input devices and help to provide inputs to the computer.



Keyboard



Touchscreen



Microphone



Mouse



Digital camera



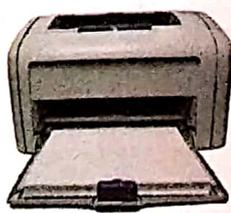
Scanner

Fig 1.1 Input devices

Output devices Devices that help to display the output after data processing are called output devices. The monitor, printer, speakers, and plotter are all output devices.



Monitor



Printer



Speakers



Plotter

Fig 1.2 Output devices

Software

The instructions given to the computer for performing various tasks comprise the software. Software are of two types, based on the functions they perform.

System software These are software on which computers work. A system software is designed in such a manner that it operates, controls, and executes various applications on the computer. An operating system like Windows is a system software.

Application software These are software designed to help the user to perform certain specific tasks. Some common types of application software are MS Paint, MS Word, MS PowerPoint, and MS Excel.

Computer languages

The computer needs to be given instructions in a language that it can understand. Computers can only read instructions written in binary code.

Binary number system

The binary number system has a base of 2. The digits 0 and 1 are called bits. The computer cannot depict 2, 3, 4, etc. as they are. Instead, they are represented using 0 and 1.

For example, 2 is depicted as 10 in the binary system. Similarly, 3 will be shown as 11, 4 as 100, 5 as 101, and so on.

The biggest problem in the binary system is that the numbers become very long. You can express any number in binary form. To do so, simply keep dividing the number by 2.

Converting a decimal number into a binary number To convert any number into the binary form, start dividing it by 2 and keep a track of the remainder. Here's an example.

Converting 285 into binary form

2	285	
2	142	Remainder 1
2	71	Remainder 0
2	35	Remainder 1
2	17	Remainder 1
2	8	Remainder 1
2	4	Remainder 0
2	2	Remainder 0
2	1	Remainder 0
0	0	Remainder 1



Remember

You have to keep dividing the number until you reach a zero quotient. Then, write the remainders upwards from the bottom number to get the binary form of the number.

∴ 285 in decimal form = 100011101 in binary form.

Converting from binary to decimal To convert a binary number to its decimal form, we use a different method of giving positional value. Here's an example.

Converting 100011101 into decimal form

9	8	7	6	5	4	3	2	1
1	0	0	0	1	1	1	0	1
2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1

Positional value

Now, we multiply the digit with the value of each multiple of 2. Therefore, it would be:

$$\begin{aligned}
 &100011101 \\
 &= 1 \times 2^9 + 0 \times 2^8 + 0 \times 2^7 + 0 \times 2^6 + 1 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 \\
 &= (1 \times 1) + 0 + (1 \times 4) + (1 \times 8) + (1 \times 16) + 0 + 0 + 0 + (1 \times 256) \\
 &= 1 + 0 + 4 + 8 + 16 + 0 + 0 + 0 + 256 \\
 &= 285
 \end{aligned}$$

It is possible to write programs straight into binary, but it is time consuming and requires seemingly endless rows of 0s and 1s. In order to pre-empt this challenge, computer languages have been developed that use decimal numbers, words, and symbols instead. These are then converted by other programs into binary code. There are two types of programming languages—low level and high level.

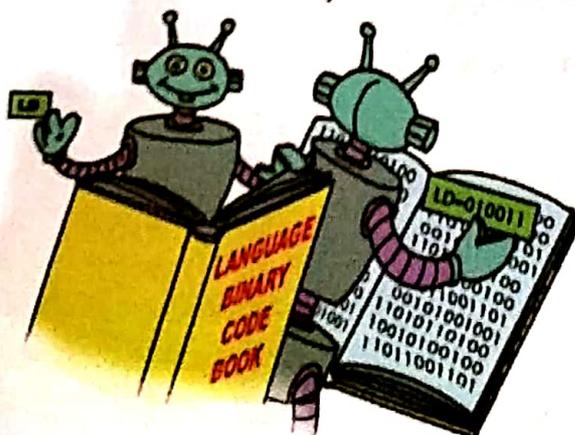


Low-level languages

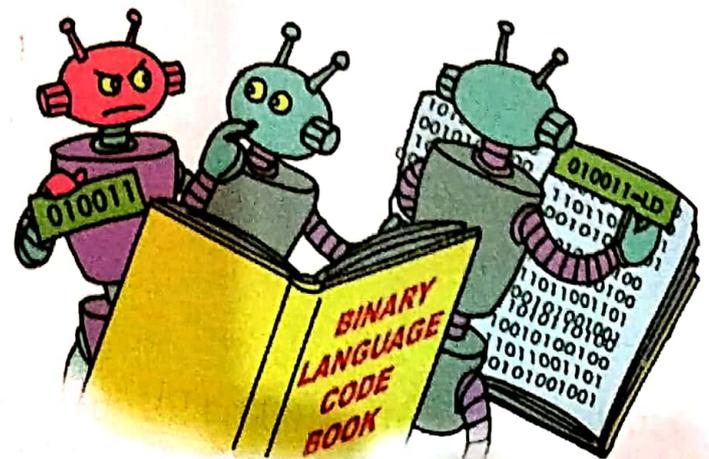
Low-level languages give instructions to a computer in machine code or close to it. These are of the following two types.

Machine language This was the first computer language to be developed, and consisted of data and instructions spelt out in 0s and 1s. It was difficult to understand.

Assembly language This language gives instructions in the form of abbreviations. For example, LD may be used for the command 'load program', or JMP for 'jump'. A program called an **assembler** is required to translate the assembly language into binary code. A **disassembler** converts binary back into the assembly language.



An assembler converts 'LD' into binary.



A disassembler converts it back again.

High-level languages

These include languages that are very similar to the English language. They are much simpler and user-friendly than the low-level languages.

High-level languages are converted into binary code by using a set of programs called **interpreter** or **compiler**.



An interpreter works while a program is running. It takes one line of the program's instruction at a time. It checks whether the instruction is correct, and then carries it out.



A compiler works before a program is run. It translates all the instructions into binary code at once, and then carries them out.

Some of the commonly known high-level languages are:

- BASIC
- COBOL (Common Business Oriented Language)
- PASCAL
- FORTRAN (FORMula TRANslator)
- LOGO
- C
- C++
- JAVA
- Visual Basic

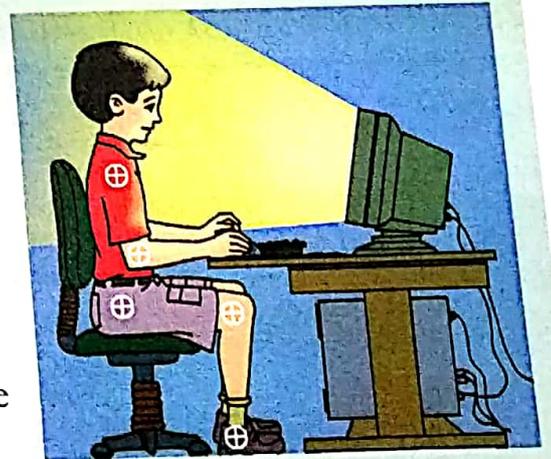
Did You Know?



FORTRAN was one of the earliest languages and was designed for scientists and engineers (the earliest computer users). COBOL was designed for business users.

COMPCARE

The height of the display screen of the monitor is very crucial. Generally, the top of the display screen should be 10 degrees above, and the centre of the screen 20 degrees below your straight-ahead seeing position. The distance from your eyes to the screen should be around 14 to 20 inches. By following this, you can minimize the strain to your eyes while using the computer.



Wordbank

- Hardware** Those parts of the computer that can be touched or felt
- Input devices** Devices that are used to feed data into the computer
- Output devices** Devices that help to display the data after processing
- Software** The instructions given to a computer to make it perform certain specific tasks
- Assembly language** Computer language that gives instructions in the form of abbreviations

We have learned

- A computer is a very useful machine that has been through several stages of development called generations.
- Hardware and software are the two key components of the computer.
- The binary system provides a language that the computer can understand and expresses the numbers in terms of 0 and 1.
- We can convert a decimal number into binary form and vice versa.



Revision Exercise 

1. Answer the following questions.

- (a) Write a short note on the various milestones in the evolution of computers.
- (b) What do you understand by the binary number system?
- (c) Write briefly about software and hardware.

2. Fill in the blanks with suitable words.

ICs assembler second high-level output

- (a) Transistors were used in the generation computers.
- (b) were introduced in the third-generation computers.
- (c) Plotter is an device.
- (d) An translates the assembly language into binary code.
- (e) An interpreter or compiler converts a language into binary code.

UNACCO SCHOOL
EXCELLENCE IN EDUCATION
STUDY MATERIAL
SUBJECT- COMPUTER
CLASS- VII

LESSON -1

ABOUT A COMPUTER

Q1. Answer the following questions:

a) Write short notes on the various milestones in the evolution of Computers.

Ans:

Generation	Period of development	Major milestone achieved	Machines developed
FIRST	1940 to 1956	Vacuum tubes introduced	ENIAC, EDVAC, UNIVAC and EDSAC
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THIRD	1964 to 1971	Integrated circuits (ICs) stored on silicon chips	IBM 360 series
FOURTH	1971 till now	Large integrated circuits (LICs), very large integrated circuits (VLICs)	Minicomputers, personal computers, high speed precision
FIFTH	Ongoing	Parallel processing with artificial intelligence (AI)	Supercomputer, AI still in the development stage

b) What do you understand by the binary number system?

Ans: The binary number system is a number system which provides a language that the computer can understand. It has a base of 2. It is expressed in 0 and 1 called bits.

Eg: the decimal number 2 is depicted as 10

3 is depicted as 11

c) Write briefly about software and hardware.

Ans: The parts of the computer that can be touched or felt are called hardware.

Eg: Keyboard, mouse, monitor, printer, CPU etc.

The set of instructions given to a computer to make it perform certain specific task are called software.

Eg: MS-Excel, QBASIC, Operating System, MS-Word etc.

Q3. Convert the decimal number into binary form:

c) 6891

Handwritten conversion of 6891 to binary using the division-by-2 method. The remainders are listed on the right of each division step. An upward-pointing arrow indicates the order of reading the remainders from bottom to top.

2	6891	
2	3445	R-1
2	1722	R-1
2	861	R-0
2	430	R-1
2	215	R-0
2	107	R-1
2	53	R-1
2	26	R-1
2	13	R-0
2	6	R-1
2	3	R-0
2	1	R-1
	0	R-1

Thus,
 $(6891)_{10} = (1101011101011)_2$

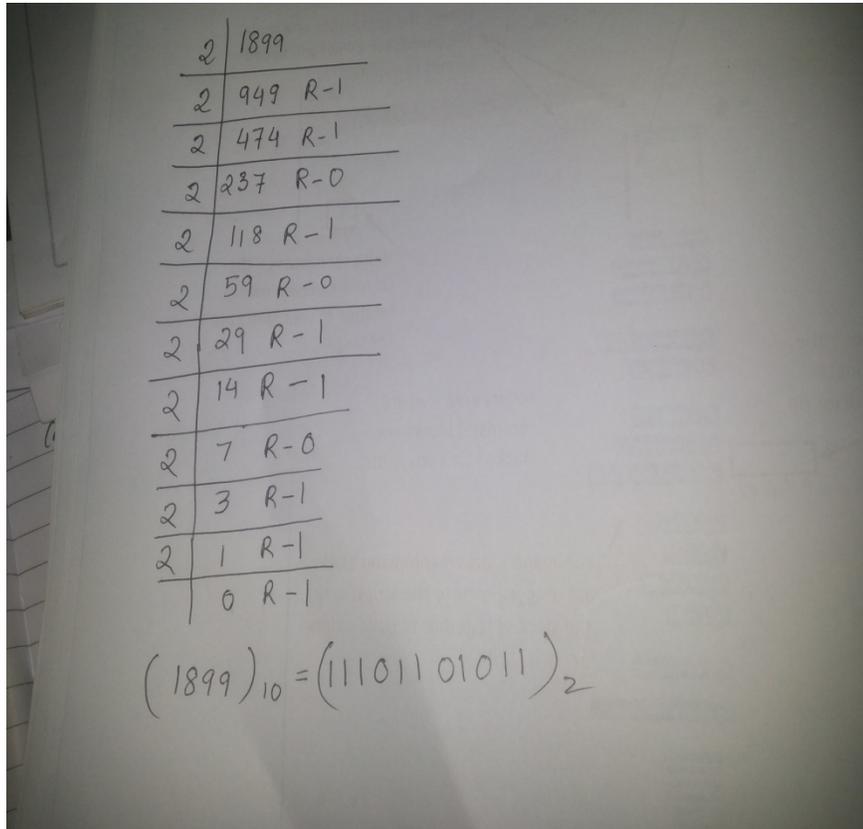
d) 7583

Handwritten conversion of 7583 to binary using the division-by-2 method. The remainders are listed on the right of each division step.

2	7583	
2	3791	R-1
2	1895	R-1
2	947	R-1
2	473	R-1
2	236	R-1
2	118	R-0
2	59	R-0
2	29	R-1
2	14	R-1
2	7	R-0
2	3	R-1
2	1	R-1
	0	R-1

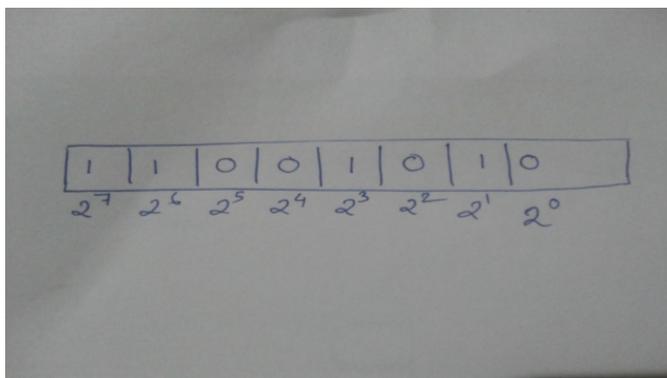
Thus, 7583 in decimal form = 111011001111 in binary form.

e) 1899



Q4. Convert the binary numbers into decimal forms:

a) 11001010



$$= (0 \times 2^0) + (1 \times 2^1) + (0 \times 2^2) + (1 \times 2^3) + (0 \times 2^4) + (0 \times 2^5) + (1 \times 2^6) + (1 \times 2^7)$$

$$= 0 + 2 + 0 + 8 + 0 + 0 + 64 + 128$$

$$= 202$$

Therefore, binary number 11001010 = 202 in decimal.

b) 100100111

1	0	0	1	0	0	1	1	1
2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0

$$= (1 \times 2^0) + (1 \times 2^1) + (1 \times 2^2) + (0 \times 2^3) + (0 \times 2^4) + (1 \times 2^5) + (0 \times 2^6) + (0 \times 2^7) + (1 \times 2^8)$$

$$= 1 + 2 + 4 + 0 + 0 + 32 + 0 + 0 + 256$$

$$= 295$$

Therefore, binary number 100100111 = 295 in decimal.

c) 1110010110

1	1	1	0	0	1	0	1	1	0
2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0

$$= (0 \times 2^0) + (1 \times 2^1) + (1 \times 2^2) + (0 \times 2^3) + (1 \times 2^4) + (0 \times 2^5) + (0 \times 2^6) + (1 \times 2^7) + (1 \times 2^8) + (1 \times 2^9)$$

$$= 0 + 2 + 4 + 0 + 16 + 0 + 0 + 128 + 256 + 512$$

$$= 918$$

Therefore, binary number 1110010110 = 918 in decimal.

EXTRA QUESTIONS:

Q1. Define the following terms:

Input device, output device, low level language and high level language.

- a) Input Device: Those devices that are used to feed data into the computer are called input devices. Eg: Mouse, Keyboard.
- b) Output Device: Those devices that help to display data after processing are called output devices. Eg: Monitor, Printer.
- c) Low level language: Low level language is a computer language which can give instruction to the computer in machine code/ close to it. Two types of low level languages are: i) Machine language ii) Assembly language
- d) High level language: High level language are a computer language which gets converted into binary code by using set of programs called interpreter/ compiler.

Q2. Differentiate between interpreter and compiler.

Ans: A compiler is a translator which transforms source language (high-level language) into object language (machine language). In contrast with a compiler, an interpreter is a program which imitates the execution of programs written in a source language. Another difference between compiler and interpreter is that compiler converts the whole program in one go on the other hand interpreter converts the program by taking a single line at a time.

Q3. Name some high level languages.

Ans: BASIC, COBOL, PASCAL, FORTRAN, LOGO, VISUAL BASIC, C, C++, JAVA etc.

HOME ASSIGNMENT

Q1 Convert the following decimal numbers into binary form:

- a) 852 b) 999 c) 200

Q2 Convert the following binary numbers into decimal form:

- a) 11100011 b) 1001100 c) 10101011

Q3 Give the full forms of the following:

- a) COBOL b) BASIC c) FORTRAN
